A wireless communication system, comprises a plurality of transceivers, receiving and transmitting RF signals; a plurality of RF processing units, processing said received signals or signals to be transmitted by said transceivers; RF resources allocator, detecting information contained in received signals from a uplink on the types of different wireless communication schemes which are requested to access, and allocating RF resources shared by said different wireless communications schemes according to said detected information.

What is claimed is:

1. A method for radio RF resources allocation in multi-standard wireless communication systems, comprising:

(a) detecting a plurality of received signals from a uplink, wherein said signals contain information on the types of the different wireless communication schemes which are requested to access; and

(b) allocating the radio RF resources shared by said different communications schemes according to said detected information.

2. The method of claim 1, wherein step (b) further includes:

(bl) carrying out a statistic of the information on the requests for accessing each of said different wireless communication schemes in a set interval; and

(b2) allocating said RF resources shared by said different wireless communication schemes according to said statistic of the set interval.

3. The method of claim 2, wherein said information on the requests for accessing each of said different wireless communication schemes includes the number of the requests for accessing each of said different wireless communication schemes.

4. The method of claim 3, wherein in step (b2), the allocation of said RF resources is realized by calculating the ratio of the number of the requests for accessing each of said different wireless communication schemes.

5. The method of any of claims 2-4, wherein in step (bl), said statistic is achieved by carrying out a statistic of said information on the requests for accessing each of said different wireless communication schemes within the set whole interval.

6. The method of any of claims 2-4, wherein in step (bl), said statistic is achieved

by carrying out a statistic of said information on the requests for accessing each of said different wireless communication schemes within rush hours of the set interval.

7. The method of claim 1, wherein step (b) further includes:

(b2) judging whether there are RF resources available for the requests for accessing said different wireless communication schemes; and

(b3) allocating said available RF resources to said requests, if there are RF resources available for said requests.

8. The method of claim 1, wherein step (b) further includes:

(bl) pre-allocating said RF resources to a specific communication scheme;

(b2) judging whether there are RF resources available for the requests for accessing the different wireless communication schemes, if the different wireless communication schemes are not the specific communication scheme; and

(b3) allocating said available RF resources to said requests, if there are RF resources available for said requests.

9. The method of claims 7 or 8, wherein step (b2) and (b3) are executed in following condition: subscribers send said connection requests for accessing said different wireless communication schemes.

10. The method of claims 7 or 8, wherein step (b2) and (b3) are executed in following condition: subscribers which carry out cell handover send said handover requests for accessing said different wireless communication schemes.

11. The method of claims 7 or 8, wherein step (b3) further includes:

(i) judging whether there are RF carrier available for said requests, if there are no RF resources available for said requests for accessing said wireless communication schemes; and

(ii) allocating said available RF carrier to said wireless communication schemes,

if there are RF carriers available for said requests, and allocating the corresponding RF resources to said requests.

12. The method of claim 11, wherein step (ii) further includes:

when the communications employing said wireless communication schemes ends, said RF carriers allocated to said requests are released.

13. The method of claim 11, wherein step (ii) further includes:

if there are no RF carriers available for said requests, said requests are rejected.

14. The method of claim 1, said wireless communication schemes include at least two of following: IS-95, CDMA, GSM, TSM, GPRS, TD-SCDMA, W-CDMA cdma 2000 and WLAN.

15. A device for RF resources allocation in multi-standard wireless communication systems, comprising:

a status detector, detecting a plurality of received signals from a uplink, wherein said signals contain information on the types of the different wireless communication schemes which are requested to access; and

a resource allocator, allocating the RF resources shared by said different communications schemes according to said detected information.

16. The device of claim 15, wherein said resource allocator allocates said RF resources according to a statistic of the information on the requests for accessing each of said different communications schemes in a set interval.

17. The device of claim 16, wherein said information on the requests for accessing each of said different communications schemes includes the number of the requests for accessing each of said different communications schemes.

18. The device of claim 17, wherein said resource allocator realizes said RF resources allocation by calculating the ratio of the number of the requests for accessing each of said different wireless communication schemes.

19. The device of any of claims 16-18, wherein said statistic is achieved by carrying out a statistic of said information on the requests for accessing each of said different wireless communication schemes within the set whole interval.

20. The device of any of claims 16-18, wherein, said statistic is achieved by carrying out a statistic of said information on requests for accessing each of said different wireless communication schemes within rush hours of the set interval.

21. The device of claim 15, wherein said RF resources allocation executed by said resource allocator includes:

(b) judging whether there are RF resources available for the requests for accessing said different wireless communication schemes; and

(c) allocating said available RF resources to said requests, if there are RF resources available for said requests.

22. The device of claim 15, wherein said RF resources allocation executed by said resource allocator includes:

(a) pre-allocating said RF resources to a specific communication scheme;

(b) judging whether there are RF resources available for the requests for accessing the different wireless communication schemes, if the different wireless communication schemes are not the specific communication scheme; and

(c) allocating said available RF resources to said requests, if there are RF resources available for said requests.

23. The device of claims 21 or 22, wherein step (b) and (c) are executed in following condition:

subscribers send said connection requests for accessing the different wireless communication schemes.

24. The device of claims 21 or 22, wherein step (b) and (c) are executed in following condition:

subscribers which carry out cell handover send said handover requests for accessing the different wireless communication schemes.

25. The device of claims 21 or 22, wherein said RF resources allocation executed by said resource allocator includes:

judging whether there are RF carriers available for said requests for accessing the different wireless communication schemes, if there are no RF resources available for said requests; and

allocating said available RF carriers to the different wireless communication schemes, if there are RF carriers available for said requests, and allocating the corresponding RF resources to said requests.

26. The device of claim 25, wherein said RF resources allocation executed by said resource allocator includes:

when the communications employing said different wireless communication schemes end, said RF carriers allocated to said requests are released.

27. The device of claim 25, wherein said RF resources allocation executed by said resources allocator includes:

if there are no RF carriers available for said requests, said requests are rejected.

28. The device of claim 15, said different wireless communication schemes include at least two of following: IS-95, CDMA, GSM, TSM, GPRS, TD-SCDMA, W-CDMA, cdma 2000 and WLAN.

29. A wireless communication system, comprising:

a plurality of transceivers, receiving and transmitting RF signals;

a plurality of RF processing units, processing said received signals or signals to be transmitted by said transceivers;

RF resources allocator, detecting the information contained in received signals from a uplink on the types of the different wireless communication schemes which are requested to access, and allocating RF resources shared by said different communications schemes according to said detected information.

30. The system of claim 29, wherein said RF resources allocator allocates said RF resources according to a statistic of the information on the requests for accessing each of said different wireless communication schemes within a set interval.

31. The system of claim 30, wherein said information on the requests for accessing each of said different wireless communication schemes includes the number of the requests for accessing each of said different wireless communication schemes.

32. The system of claim 31, wherein said RF resources allocator realizes said RF resources allocation by calculating the ratio of the number of the requests for accessing each of said different wireless communication schemes.

33. The system of any of claims 30-32, wherein said statistic is achieved by carrying out a statistic of said information on the requests for accessing each of said different wireless communication schemes within the set whole interval.

34. The system of any of claims 30-32, wherein, said statistic is achieved by carrying out a statistic of said information on the requests for accessing each of said different wireless communication schemes within rush hours of the set interval.

35. The system of claim 29, wherein said RF resources allocation executed by

said RF resources allocator includes:

(b) judging whether there are RF resources available for the requests for accessing said different wireless communication schemes; and

(c) allocating said available RF resources to said requests, if there are RF resources available for said requests.

36. The system of claim 29, wherein said RF resources allocation executed by said RF resources allocator includes:

(a) pre-allocating said RF resources to a specific communication scheme;

(b) judging whether there are RF resources available for the requests for accessing the different wireless communication schemes, if the different wireless communication schemes are not the specific communication scheme; and

(c) allocating said available RF resources to said requests, if there are RF resources available for said requests.

37. The system of claims 35 or 36, wherein step (b) and (c) are executed in following condition: subscribers send said connection requests for accessing the different wireless communication schemes.

38. The system of claims 35 or 36, wherein step (b) and (c) are executed in following condition: subscribers which carry out cell handover send said handover requests for accessing the different wireless communication schemes.

39. The system of claims 35 or 36, wherein said RF resources allocation executed by said RF resources allocator includes:

judging whether there are RF carriers available for said requests for accessing the different wireless communication schemes, if there are no RF resources available for said requests; and

allocating said available RF carriers to the different wireless communication schemes, if there are RF carriers available for said requests, and allocating the

corresponding RF resources to said requests.

40. The system of claim 39, wherein said RF resources allocation executed by said RF resources allocator includes:

when the communications employing said different wireless communication schemes end, said RF carriers allocated to said requests are released.

41. The system of claim 39, wherein said RF resources allocation executed by said RF resources allocator includes:

if there are no RF carriers available for said requests, said requests are rejected.

42. The system of claim 39, said different wireless communication schemes include at least two of following: IS-95, CDMA, GSM, TSM, GPRS, TD-SCDMA, W-CDMA, cdma 2000 and WLAN.

METHOD AND DEVICE FOR RADIO RESOURCE ALLOCATION IN MULTI-STANDARD WIRELESS COMMUNICATION SYSTEMS

Field of the Invention

The present invention relates to multi-standards wireless communication systems; and, more particularly, to method and apparatus for allocating RF resources in multi-standard communication systems.

Background of the Invention

With the development of mobile communication systems, more and more communication standards (i. e. wireless communication schemes) came into emergence, e. g. , GSM, IS-95 and CDMA, which belong to the second generation (2G) communication scheme, GPRS and TSM, which belong to the from-2G-to-3G communication scheme, TD-SCDMA, W-CDMA and cdma2000, which fall into the third generation (3G) communication scheme, and even WLAN, another popular wireless communication scheme, and etc.

According to the regulation of ITU, mobile communication systems with different wireless communication schemes are required to transmit data using carriers in different frequency bands. However, with the rapid development of communication services, various wireless communication schemes appeared, i. e. different wireless communication schemes may transmit data using different carriers within the same frequency band. Typically, TSM communication scheme proposed by CWTS (China Wireless Communication Standard group) shares the same frequency band with TD-SCDMA communication scheme.

TD-SCDMA is a TDD-mode communication scheme to transmit data with SCDMA (synchronous code division multiple access) technology, while TSM is designed as an evolving communication scheme from existing communication system with GSM communication scheme to the communication system with TD-SCDMA

communication scheme. As an interim communication scheme, TSM communication scheme shares the same frequency band with TD-SCDMA communication scheme to transmit data.

When a communication system is evolving from TSM communication scheme to TD-SCDMA communication scheme, TSM subscribers and TD-SCDMA subscribers experience constant changes, i. e. , in the prologue of the evolution, TSM subscribers account for the majority, with the evolution going along TSM subscribers decrease and TD-SCDMA subscribers increase gradually, and TSM subscribers only account for a minority while TD-SCDMA subscribers constitute the majority in the epilogue of the evolution. Distinct changes in the structure of TSM subscribers and TD-SCDMA subscribers require different frequency resources, therefore the limited frequency resources need to be allocated dynamically among co-existing wireless communication schemes, so as to achieve rational allocation and reuse of RF resources.

Summary of the Invention

It is, therefore, an object of the present invention to provide a method and an apparatus for allocating RF resources in multi-standard wireless communication systems, which capable of dynamically allocating limited RF resources to co-existing wireless communication schemes according to the requirements.

Another object of the invention is to provide a method and an apparatus for allocating RF resources in multi-standard wireless communication systems, which capable of statistically configuring the RF resources shared by co-existing wireless communication schemes to improve the utilization of spectrum, in the long evolving process.

Another object of the invention is to provide a method and an apparatus for allocating RF resources among multi-standard wireless communication systems, which capable of making expected configurations to the RF resources shared by co-existing wireless communication schemes to improve the utilization of spectrum,

in the prologue and the epilogue of the evolution.

To meet the object above, a method for allocating RF resources among multi-standard wireless communication systems, as proposed in the present invention, comprising:

(a) detecting a plurality of received signals from a uplink, wherein said signals contain information on the types of the different wireless communication schemes which are requested to access; and

(b) allocating the radio RF resources shared by said different communications schemes according to said detected information.

To achieve the object above, an apparatus for allocating RF resources among multi-standard wireless communication systems, as proposed in the present invention, comprising:

a status detector, detecting a plurality of received signals from a uplink, wherein said signals contain information on the types of the different wireless communication schemes which are requested to access; and

a resource allocator, allocating the RF resources shared by said different communications schemes according to said detected information.

To attain the object above, a wireless communication system, as proposed in the present invention, comprising:

a plurality of transceivers, receiving and transmitting RF signals;

a plurality of RF processing units, processing said received signals or signals to be transmitted by said transceivers;

RF resources allocator, detecting the information contained in received signals from a uplink on the types of the different wireless communication schemes which are requested to access, and allocating RF resources shared by said different communications schemes according to said detected information.

Brief Description of the Drawings

Further description to the invention will be given below, in conjunction with the

accompanying figures, wherein:

Fig. 1 diagrams the structure of a cellular communication system;

Fig. 2 depicts the structure of each cell of the cellular communication system in Fig. 1;

Fig. 3 illustrates the structure of a base station/node of each cell in Fig. 2;

Fig. 4 is the flow chart of the expected configuration method 1;

Fig. 5 is the flow chart of the expected configuration method 2.

Detailed Description of the Preferred Embodiments

This invention provides a method and an apparatus for dynamically allocating RF resources to co-existing wireless communication schemes in a base station, according to different requirements of the co-existing wireless communication schemes. In the following embodiments of a wireless communication system where TSM and TD-SCDMA wireless communication schemes co-exist, the method and apparatus have different characteristics when applied in said co-existing wireless communication schemes during different evolving phases.

Descriptions will respectively be presented, in conjunction with the accompanying drawings, to the method and apparatus for statistical configuration of the shared RF resources, as provided in the invention, during the evolving process, and the method and apparatus for expected configuration of the shared RF resources, as provided in the invention, during the prologue and the epilogue of the evolving process, in the communication system where TSM and TD-SCDMA wireless communication schemes co-exist.

As shown in Fig. 1, A, B, C, D, E and Z represent 6 cells, which constitute a mobile communication system where cell Z is the center cell and cell A-E are adjacent cells of cell Z.

As shown in Fig. 2, every cell in Fig. 1 contains a base station 10 (namely Node B), and one or many mobile terminals 20.

Fig. 3 demonstrates the structure of the base station 10 of a cell in Fig. 2. As shown in Fig. 3, the base station 10 includes N antennas 30 for receiving and transmitting RF signals, N RF units 40 and a controller 50, wherein:

Every RF unit 40 is composed of a transceiver, a modulator and a demodulator. An input/output of the transceiver is coupled to the corresponding antenna 30 to receive RF signals from antenna 30 or transmit RF signals via antenna 30, an output of the transceiver is coupled to an input of said demodulator to demodulate the received RF signals, and an input of the transceiver is coupled to the output of said modulator to send the modulated signals to antenna 30 for transmitting. Every RF unit 40 has its own RF carriers to transmit data.

Said controller 50 comprises a processor 60, an allocator 80, a memory 70 and a system status detector 90, wherein said processor 60 is coupled to another input/output of the transceiver in each said RF units 40, to receive signals from each RF units 40, at the same time said processor 60 communicates with allocator 80, memory 70 and system status detector 90, more particularly, status detector 90 detects the types of the wireless communication schemes which are requested to access, according to the signals from processor 60; when used to store information on RF resources allocation in multi-standard wireless communication systems, memory 70 is also used to record the number of the requests for accessing each of the wireless communication schemes detected by status detector 90 in a certain period, if the base station chooses the method of statistical configuration of RF resources; resource allocator 80 dynamically allocates RF resources shared by said TSM and TD-SCDMA wireless communication schemes, according to the number of the requests for accessing each of the different wireless communication schemes recorded by the memory in statistical configuration method, or according to the types of the wireless communication schemes detected by status detector 90 and the information on RF resources allocation stored in the memory; then processor 60 controls and adjusts the RF carriers in RF unit 40 according to instructions from resource allocator 80.

Detailed descriptions as follows will be respectively given to said statistical configuration method and expected configuration method, according to different

evolving phases of TSM and TD-SCDMA communication schemes.

Statistical configuration method

Generally speaking, the evolution from TSM communication scheme to TD-SCDMA communication scheme is a long-term procedure, which could last several years. In this case, subscribers of the two wireless communication schemes won't change dramatically during the procedure, so the configuration of RF resources can be done at intervals, for example every other month.

Resource allocator 80 reallocates RF carriers in each cell according to the number of the requests for accessing each of TSM wireless communication scheme and the number for TD-SCDMA wireless communication scheme recorded by memory 70 within an interval, wherein the number recorded by memory 70 is the total traffic load number of each of the two wireless communication schemes within the whole interval. Before the next interval starts, memory 70 will be cleared to record the number of the requests for accessing each of TSM and TD-SCDMA wireless communication schemes detected by status detector 90 in the next interval.

Two embodiments will be offered to display the statistical configuration method, wherein allocator 80 dynamically allocates RF resources according to the number of the requests for accessing each of said wireless communication schemes.

Embodiment 1:

When needing to configure RF resources after an interval, allocator 80 first accesses memory 70 to inquire the number of the requests for accessing each of the two wireless communication schemes detected by status detector 90 within the interval, and calculates the ratio R of the number of the requests for accessing TSM communication scheme to the number of the requests for accessing TD-SCDMA communication scheme. Afterwards, assumed that the number of RF carriers in a cell is N, allocator 80 allocates the number of carriers for TSM communication scheme as NI, and that of TD-SCDMA communication scheme as N2, where N1+N2=N, and calculates the value of N1/N2. Allocator 80 allocates several sets of N1 and N2 (N1

and N2 should be kept no less than 1 so as to guarantee the two wireless communication schemes accessible), and acquires the value of f1/N2 of every set of N1 and N2, and then according to the calculated ratio R, allocator 80 picks the value of N1/N2 which is closest to R, and allocates the N RF carriers to the two TSM and TD-SCDMA wireless communication schemes.

For example, the number is 3.4Erl for TSM wireless communication scheme and 8.5Erl for TD-SCDMA wireless communication scheme and N=8, then R=0.4. If 2 RF carriers are allocated to TSM wireless communication scheme and 6 to TD-SCDMA wireless communication scheme, it can be obtained that N1/N2=0.3333. If 3 RF carriers are allocated to TSM wireless communication scheme and 5 to TD-SCDMA wireless communication scheme, it can be gotten that N1/N2=0.6. As above, allocator 80 should choose the first RF carriers allocation, which is closer to R.

Embodiment 2:

In embodiment 1, allocator 80 uses the number of the requests for accessing each of TSM and TD-SCDMA wireless communication schemes within the whole interval to calculate the traffic ratio R. However, the most important data is the data from rush hour of the interval which is most related to the block rate, so in embodiment 2 a slight revision can be taken to embodiment 1, i. e. instead of the number of the requests within the whole interval, only the number of the requests from rush hour of the interval is used to calculate the ratio R, and others are the same as embodiment 1.

Expected Configuration method

In the prologue of evolution, TD-SCDMA subscribers will be much fewer than TSM subscribers. In this case, it will be very inefficient if RF carriers for TD-SCDMA wireless communication scheme are still reserved in each cell. Embodiment 1 of the expected configuration method in this invention is introduced to solve this problem.

Embodiment 1:

According to the expected configuration method, all RF carriers in a cell will be allocated to TSM wireless communication scheme. a RF carrier will be allocated to

TD-SCDMA wireless communication scheme only in the following cases:

(1) A TD-SCDMA subscriber sends a connection request in the cell;

(2) A TD-SCDMA subscriber moves from an adjacent cell to the cell and sends a handover request in the cell.

As the expected configuration method shown in Fig. 4, in a cell, when there is no connection from any TD-SCDMA subscriber, all RF carriers are allocated to TSM wireless communication scheme (S1). When a TD-SCDMA subscriber in the cell sends a request for connection or handover (S10), the base station in the cell will first judge whether there are RF resources available for TD-SCDMA wireless communication scheme (S20), the RF resources will be allocated to said request if there are RF resources available for TD-SCDMA wireless communication scheme (S30), if there are no RF resources available for TD-SCDMA wireless communication scheme, it will judge whether there are RF carriers available (S40), if there are RF carriers available, a RF carrier will be allocated to TD-SCDMA wireless communication scheme (S50) and then the RF resources corresponding to the RF carrier will be allocated to said request (S60), if there are no RF carriers available, the request will be rejected (S70) and the request will be terminated (S1001).

Once all communications of TD-SCDMA wireless communication scheme in the cell end, i.e. once there is no connection of TD-SCDMA wireless communication scheme in said cell, the RF carriers occupied by TD-SCDMA wireless communication scheme will be reallocated to TSM wireless communication scheme.

In the epilogue of evolution, the case reverses totally. Almost all subscribers are of TD-SCDMA wireless communication scheme, except for very few TSM subscribers. In this case, it can be very inefficient if RF carriers are still reserved for TSM communication in each cell. Embodiment 2 of the expected configuration method of this invention is introduced to solve this problem.

Embodiment 2:

According to said expected configuration method, all RF carriers in a cell will be allocated to TD-SCDMA wireless communication scheme except for the following cases where one RF carrier will be allocated to TSM wireless communication scheme:

(1) A TSM subscriber sends a connection request in the cell;

(2) A TSM subscriber moves from an adjacent cell to the cell and sends a handover request in the cell.

As the expected configuration method shown in Fig. 5, in a cell, when there is no connection from TSM subscribers, all RF carriers are allocated to TD-SCDMA wireless communication scheme (S1). When a TSM subscriber in the cell sends a request for connection or handover (S 100), the base station in the cell will first judge whether there are RF resources available for TSM wireless communication scheme (S200), if there are RF resources available for TSM wireless communication scheme, the RF resources will be allocated to said request (S300), if there are no RF resources available for TSM wireless communication scheme, it will judge whether there are RF carriers available (S400), if there are RF carriers available, a RF carrier will be allocated to TSM wireless communication scheme (S500) and then the RF resources corresponding to the RF carrier will be allocated to said request (S600), if there are no RF carriers available, the request will be rejected (S700) and the request will be terminated (S1001).

Once all communications of TSM wireless communication scheme end (S1000), i. e. once there is no connection of TSM wireless communication scheme in the cell, the RF carriers occupied by TSM wireless communication scheme will be reallocated to TD-SCDMA wireless communication scheme.

In fact, we will designate the most of the RF carriers by statistical configuration method and reserve a few carriers for expected configuration method to accommodate the rapid variation of the number of subscribers in different wireless communication schemes.

Beneficial Use the Invention

As to the method and apparatus provided by the present invention for allocating RF resources in multi-standard wireless communication systems, because the resource allocator of the apparatus can timely allocate RF resources shared by co-existing

wireless communication schemes according to the number of the requests for accessing each of the different wireless communication schemes detected by the status detector, therefore, the method and apparatus can dynamically allocate limited RF resources to co-existing wireless communication schemes.

As to the method and apparatus provided by the present invention for allocating RF resources in multi-standard wireless communication systems, because the method and apparatus can employ statistical configuration method, expected configuration method, or their combination, according to different evolving phases of the communication system and different ratio of traffic requirements, accordingly, the method and apparatus can realize rational configuration of RF resources shared by co-existing wireless communication schemes, thus to increase the utilization of limited RF resources.

Of course, while the invention has been shown and described with respect to the preferred embodiment, it will be understood by those skilled in the art that the RF resource allocation method for multi-standard wireless communication systems provided in this invention may not be limited to the communication system with TSM or TD-SCDMA communication scheme, but also applicable to the communication systems with other wireless communication schemes.

It will also be understood by those skilled in the art that various improvements can be made to the RF resource allocation method for multi-standard wireless communication systems released in this invention. Therefore, the scope of the invention to be protected needs to be determined by what is claimed.

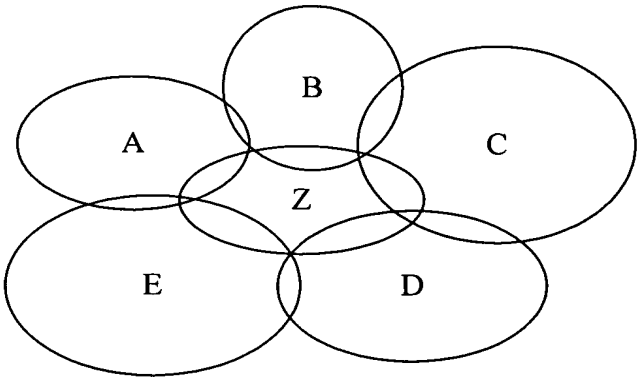


Fig.1

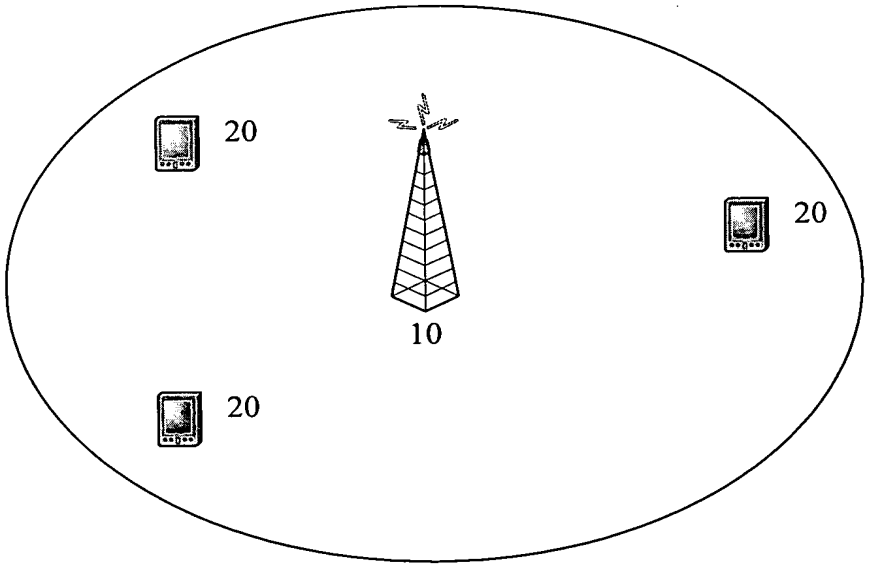


Fig.2

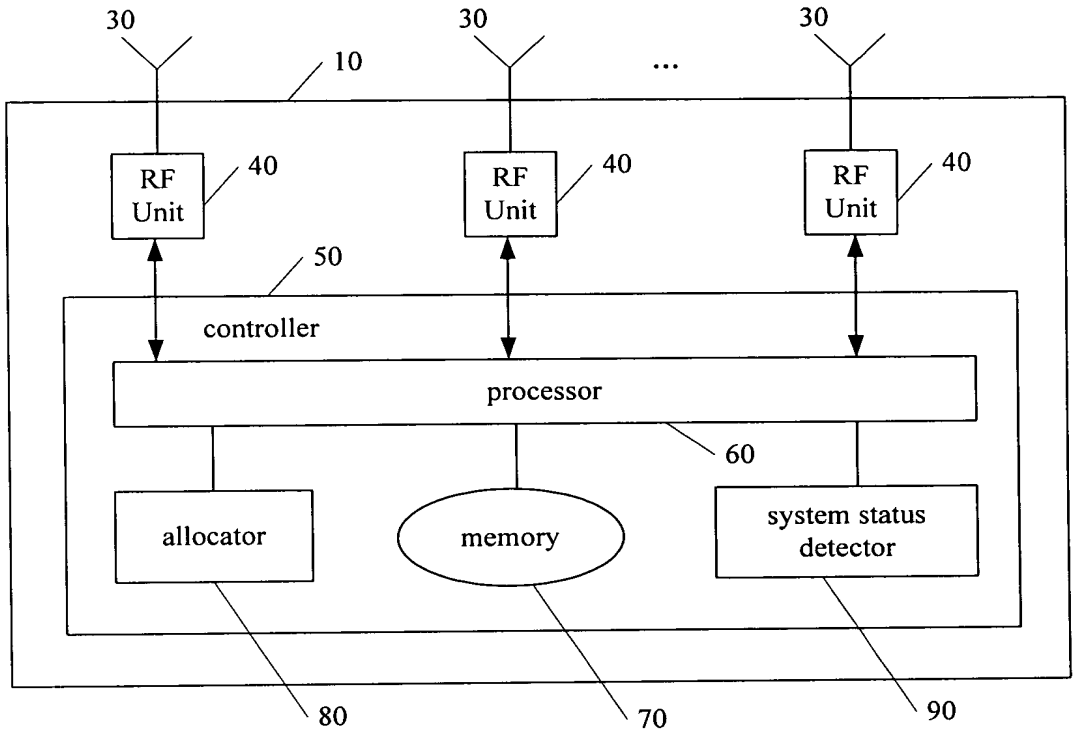

30
30
30
10
...
RF Unit
40
RF Unit
40
RF Unit
40
50
controller
processor
60
allocator
memory
system status detector
80
70
90

Fig.3

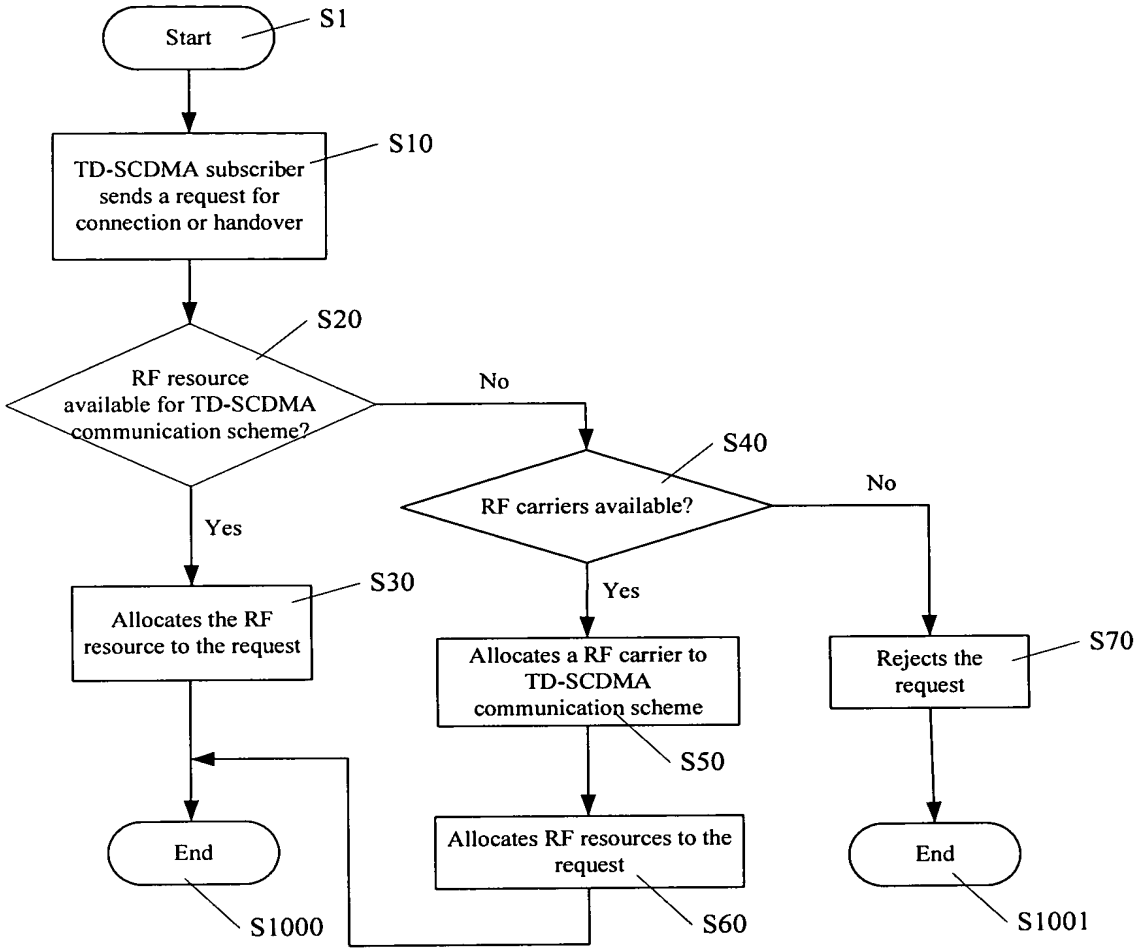

Start
S1
TD-SCDMA subscriber sends a request for connection or handover
S10
RF resource available for TD-SCDMA communication scheme?
S20
No
Yes
RF carriers available?
S40
No
Yes
Allocates the RF resource to the request
S30
Allocates a RF carrier to TD-SCDMA communication scheme
S50
Rejects the request
S70
End
S1000
Allocates RF resources to the request
S60
End
S1001

Fig.4

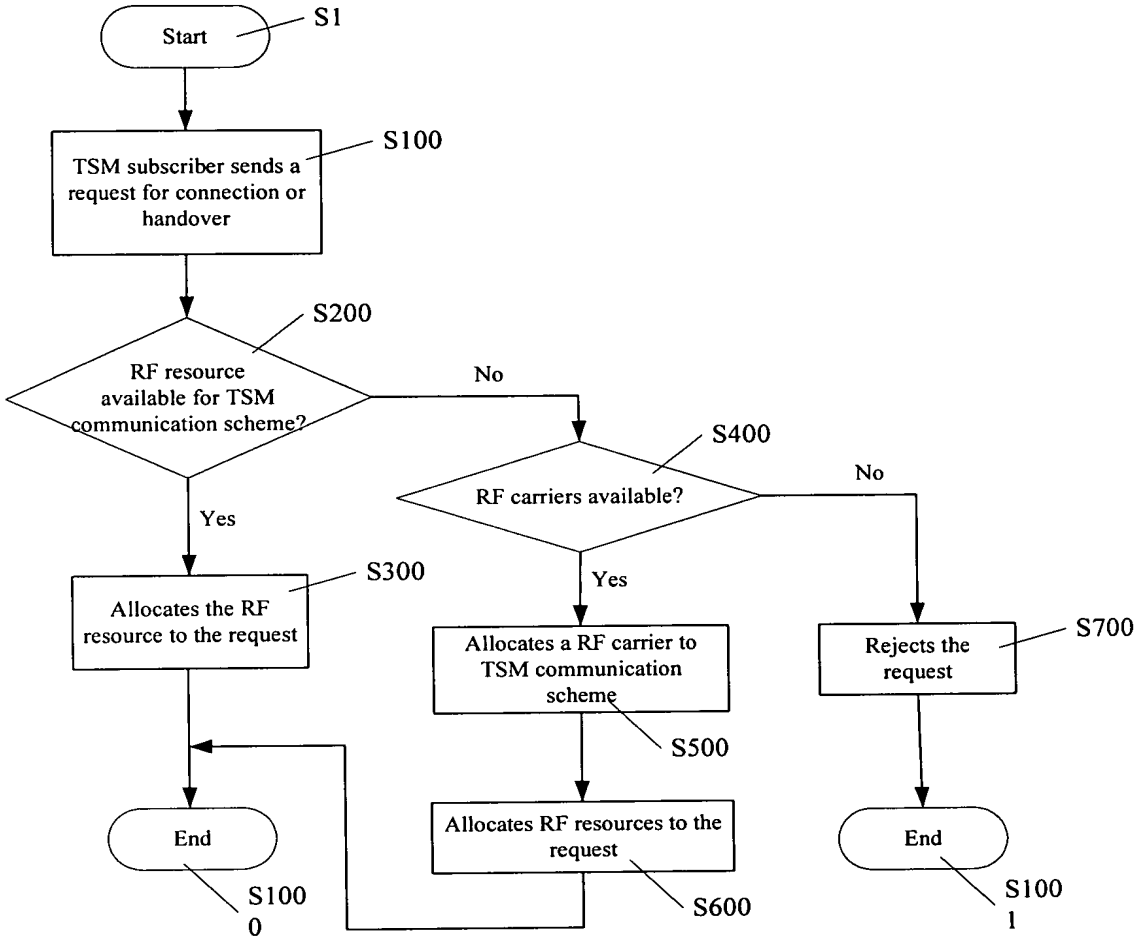
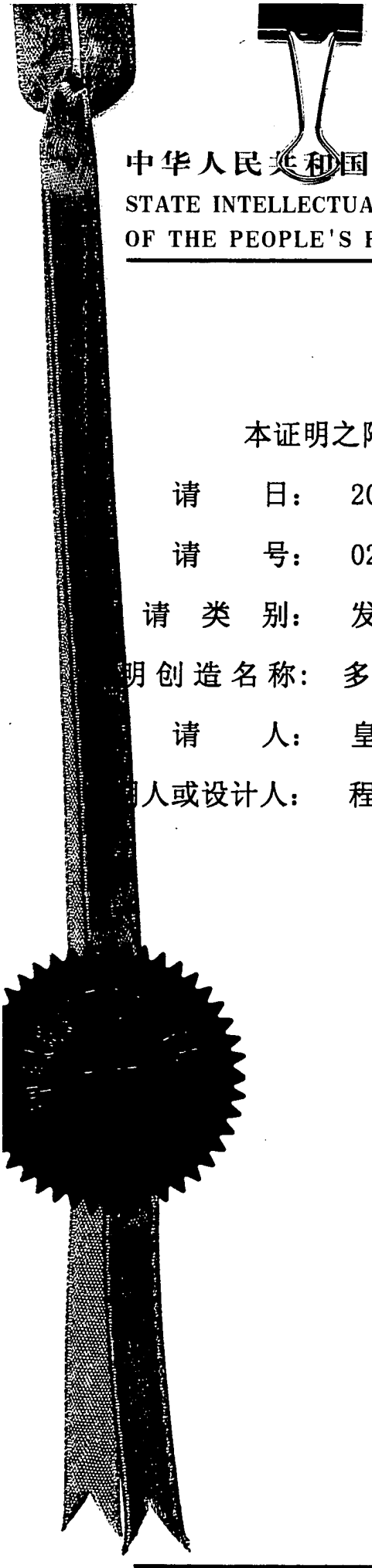

Start
S1
TSM subscriber sends a request for connection or handover
S100
RF resource available for TSM communication scheme?
S200
No
Yes
RF carriers available?
S400
No
Yes
Allocates the RF resource to the request
S300
Allocates a RF carrier to TSM communication scheme
S500
Rejects the request
S700
End
S100 0
Allocates RF resources to the request
S600
End
S100 1

Fig.5



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证　　明

本证明之附件是向本局提交的下列专利申请副本

请　　日：　2002.12.27

请　　号：　02160404.5

请 类 别：　发明专利

明创造名称：　多标准无线通信系统中射频资源分配的方法和装置

请　　人：　皇家飞利浦电子股份有限公司

人或设计人：　程江,马霓,张学军

中华人民共和国
国家知识产权局局长　田力普

2009 年 11 月 24 日

权 利 要 求 书

1、一种多标准无线通信系统中的射频资源分配方法，包括步骤：

检测所接收的多个来自上行链路的信号，该多个信号中包含有关于所请求接入不同无线通信体制类型的信息；

根据检测到的所请求接入的无线通信体制类型的信息，对所述不同无线通信体制共享的射频资源进行分配。

2、如权利要求 1 所述的多标准无线通信系统中的射频资源分配方法，其中对射频资源进行分配的步骤进一步包括：

统计所设定时间段内检测到的每种无线通信体制请求接入的信息；

根据所述所设定时间段内统计的每种无线通信体制请求接入的信息，分配所述不同无线通信体制共享的射频资源。

3、如权利要求 2 所述的多标准无线通信系统中的射频资源分配方法，其中所述检测到的每种无线通信体制请求接入的信息包括：每种无线通信体制请求接入的次数。

4、如权利要求 3 所述的多标准无线通信系统中的射频资源分配方法，其中根据每种无线通信体制请求接入的信息，分配射频资源的步骤，是通过计算每种无线通信体制请求接入次数的比值，实现射频资源的分配。

5、如权利要求 2 或 3 或 4 所述的多标准无线通信系统中的射频资源分配方法，其中，所述统计所设定时间段内的每种无线通信体制请求接入的信息是统计在该时间段内的全部时段上每种无线通信体制请求接入信息。

6、如权利要求 2 或 3 或 4 所述的多标准无线通信系统中的射频

资源分配方法，其中，所述统计所设定时间段内的每种无线通信体制请求接入的信息是统计在该时间段内的业务高峰时期每种无线通信体制请求接入信息。

7、如权利要求 1 所述的多标准无线通信系统中的射频资源分配方法，其中对射频资源进行分配的步骤进一步包括：

步骤 b：判断当前是否存在空闲的资源，可供所述检测到的无线通信体制的请求所使用；

步骤 c：若存在空闲的可供所述检测到的无线通信体制的请求所使用的资源，则将该资源分配给该请求。

8、如权利要求 1 所述的多标准无线通信系统中的射频资源分配方法，其中对射频资源进行分配的步骤进一步包括：

步骤 a：预先将射频资源分配给一特定的无线通信体制；

步骤 b：如果所述检测到的所请求接入的无线通信体制不是所述特定的无线通信体制，则判断当前是否存在空闲的资源，可供所述检测到的无线通信体制的请求所使用；

步骤 c：若存在空闲的资源，可供所述检测到的无线通信体制的请求所使用，则将该资源分配给该请求。

9、如权利要求 7 或 8 所述的多标准无线通信系统中的射频资源分配方法，其中所述步骤 b 与步骤 c 在下述情况下执行：

有移动终端用户发出接入所述无线通信体制的连接请求。

10、如权利要求 7 或 8 所述的多标准无线通信系统中的射频资源分配方法，其中所述步骤 b 与步骤 c 在下述情况下执行：

有移动终端用户进行小区切换，产生所述无线通信体制的切入请求。

11、如权利要求 7 或 8 所述的多标准无线通信系统中的射频资源

分配方法，其中对射频资源进行分配的步骤进一步包括：

如果不存在空闲的资源可供所述检测到的无线通信体制的请求所使用，则判断当前是否存在一个空闲的载波；

若当前存在一个空闲的载波，则将该空闲的载波分配给所述检测到的无线通信体制，然后再将该资源分配给该请求。

12、如权利要求 11 所述的多标准无线通信系统中的射频资源分配方法，其中对射频资源进行分配的步骤进一步包括：在采用所述无线通信体制进行的通信结束后，释放分配给该请求所使用的载波。

13、如权利要求 11 所述的多标准无线通信系统中的射频资源分配方法，其中对射频资源进行分配的步骤进一步包括：若当前不存在一个空闲的载波，则拒绝该接入请求。

14、如权利要求 1 所述的多标准无线通信系统中的射频资源分配方法，其中，所述无线通信体制至少包括以下两种：IS-95 标准、CDMA 标准、GSM 标准、TSM 标准、GPRS 标准、TD-SCDMA 标准、W-CDMA 标准、cdma2000 标准以及 WLAN 标准。

15、一种多标准无线通信系统中的射频资源分配装置，包括：

一个状态检测器，用于检测所接收的多个来自上行链路的信号，该信号中包含有关于所请求接入的不同无线通信体制类型的信息；

一个资源分配器，用于根据检测到的所请求接入的无线通信体制类型的信息，对所述不同无线通信体制共享的射频资源进行分配。

16、如权利要求 15 所述的多标准无线通信系统中的射频资源分配装置，其中所述资源分配器是根据统计的所设定时间段内的每种无线通信体制请求接入的信息，分配射频资源。

17、如权利要求 16 所述的多标准无线通信系统中的射频资源分

配装置，其中每种无线通信体制请求接入的信息，包括：每种无线通信体制请求接入的次数。

18、如权利要求 17 所述的多标准无线通信系统中的射频资源分配装置，其中所述资源分配器是通过计算每种无线通信体制请求接入次数的比值，实现射频资源的分配。

19、如权利要求 16 或 17 或 18 所述的多标准无线通信系统中的射频资源分配装置，其中，所述统计的所设定时间段内的每种无线通信体制的请求接入的信息是在该时间段内的全部时段上每种无线通信体制的请求接入的信息。

20、如权利要求 16 或 17 或 18 所述的多标准无线通信系统中的射频资源分配装置，其中，所述统计的所设定时间段内的每种无线通信体制的请求接入的信息是在该时间段内的业务高峰时期每种无线通信系统的请求接入的信息。

21、如权利要求 15 所述的多标准无线通信系统中的射频资源分配装置，其中所述资源分配器执行的分配射频资源的操作，包括：

步骤 b：判断当前是否存在空闲的资源，可供所述检测到的无线通信体制的请求所使用；

步骤 c：若存在空闲的可供所述检测到的无线通信体制的请求所使用的资源，则将该资源分配给该请求。

22、如权利要求 15 所述的多标准无线通信系统中的射频资源分配装置，其中所述资源分配器执行的分配射频资源的操作，包括：

步骤 a：预先将射频资源分配给一特定的无线通信体制；

步骤 b：如果所述检测到的所述请求接入的无线通信体制不是所述特定的无线通信体制，则判断当前是否存在空闲的资源，可供所述检测到的无线通信体制的请求所使用；

步骤 c：若存在空闲的资源，可供所述检测到的无线通信体制的请求所使用，则将该资源分配给该请求。

23、如权利要求 21 或 22 所述的多标准无线通信系统中的射频资源分配装置，其中所述步骤 b 与步骤 c 在下述情况下执行：

有移动终端用户发出接入所述无线通信体制的连接请求。

24、如权利要求 21 或 22 所述的多标准无线通信系统中的射频资源分配方法，其中所述步骤 b 与步骤 c 在下述情况下执行：

有移动终端用户进行小区切换，产生所述无线通信体制的切入请求。

25、如权利要求 21 或 22 所述的多标准无线通信系统中的射频资源分配装置，其中所述资源分配器执行的分配射频资源的操作进一步包括：

如果不存在空闲的的资源，可供所述检测到的无线通信体制的请求所使用，则判断当前是否存在一个空闲的载波；

若当前存在一个空闲的载波，则将该空闲的载波分配给所述检测到的无线通信体制，然后再将该资源分配给该请求。

26、如权利要求 25 所述的多标准无线通信系统中的射频资源分配装置，其中所述资源分配器执行的分配射频资源的操作进一步包括：在采用所述无线通信体制进行的通信结束后，释放分配给该请求所使用的载波。

27、如权利要求 25 所述的多标准无线通信系统中的射频资源分配装置，其中所述资源分配器执行的分配射频资源的操作进一步包括：若当前不存在一个空闲的载波，则拒绝该接入请求。

28、如权利要求 15 所述的多标准无线通信系统中的射频资源分

配装置，其中，所述无线通信体制至少包括以下两种：IS-95 标准、CDMA 标准、GSM 标准、TSM 标准、GPRS 标准、TD-SCDMA 标准、W-CDMA 标准、cdma2000 标准以及 WLAN 标准。

29、一种无线通信系统，包括：

多个收发装置，用于接收和发送射频信号；

多个射频处理单元，用于处理所述收发装置所接收的或待发送的信号；

射频资源分配装置，用于检测所接收的来自上行链路的信号中包含的关于所请求接入的不同无线通信体制类型的信息，并根据检测到的所请求接入的无线通信体制类型的信息，对该不同无线通信体制共享的射频资源进行分配。

30、如权利要求 29 所述的无线通信系统，其中所述射频资源分配装置是根据统计的所设定时间段内的每种无线通信体制请求接入的信息，分配射频资源。

31、如权利要求 30 所述的无线通信系统，其中每种无线通信体制请求接入的信息，包括：每种无线通信体制请求接入的次数。

32、如权利要求 31 所述的无线通信系统，其中所述射频资源分配装置是通过计算每种无线通信体制请求接入次数的比值，实现射频资源的分配。

33、如权利要求 30 或 31 或 32 所述的无线通信系统，其中，所述统计的所设定时间段内的每种无线通信体制的请求接入的信息是在该时间段内的全部时段上每种无线通信体制的请求接入的信息。

34、如权利要求 30 或 31 或 32 所述的无线通信系统，其中，所述统计的所设定时间段内的每种无线通信体制的请求接入的信息是

在该时间段内的业务高峰时期每种无线通信系统的请求接入的信息。

35、如权利要求 29 所述的无线通信系统，其中所述射频资源分配装置执行的分配射频资源的操作，包括：

步骤 b：判断当前是否存在空闲的资源，可供所述检测到的无线通信体制的请求所使用；

步骤 c：若存在空闲的可供所述检测到的无线通信体制的请求所使用的资源，则将该资源分配给该请求。

36、如权利要求 29 所述的无线通信系统，其中所述射频资源分配装置执行的分配射频资源的操作，包括：

步骤 a：预先将射频资源分配给一特定的无线通信体制；

步骤 b：如果所述检测到的所述请求接入的无线通信体制不是所述特定的无线通信体制，则判断当前是否存在空闲的资源，可供所述检测到的无线通信体制的请求所使用；

步骤 c：若存在空闲的资源，可供所述检测到的无线通信体制的请求所使用，则将该资源分配给该请求。

37、如权利要求 35 或 36 所述的无线通信系统，其中所述步骤 b 与步骤 c 在下述情况下执行：

有移动终端用户发出接入所述无线通信体制的连接请求。

38、如权利要求 35 或 36 所述的无线通信系统，其中所述步骤 b 与步骤 c 在下述情况下执行：

有移动终端用户进行小区切换，产生所述无线通信体制的切入请求。

39、如权利要求 35 或 36 所述的无线通信系统，其中所述射频资源分配装置执行的分配射频资源的操作进一步包括：

如果不存在空闲的的资源，可供所述检测到的无线通信体制的请

求所使用，则判断当前是否存在一个空闲的载波；

若当前存在一个空闲的载波，则将该空闲的载波分配给所述检测到的无线通信体制，然后再将该资源分配给该请求。

40、如权利要求 39 所述的无线通信系统，其中所述射频资源分配装置执行的分配射频资源的操作进一步包括：在采用所述无线通信体制进行的通信结束后，释放分配给该请求所使用的载波。

41、如权利要求 39 所述的无线通信系统，其中所述射频资源分配装置执行的分配射频资源的操作进一步包括：若当前不存在一个空闲的载波，则拒绝该接入请求。

42、如权利要求 29 所述的无线通信系统，其中，所述无线通信体制至少包括以下两种：IS-95 标准、CDMA 标准、GSM 标准、TSM 标准、GPRS 标准、TD-SCDMA 标准、W-CDMA 标准、cdma2000 标准以及 WLAN 标准。

说 明 书

多标准无线通信系统中
射频资源分配的方法和装置

技术领域

本发明涉及采用多种通信标准的无线通信系统，特别涉及多标准无线通信系统中的射频资源分配的方法和装置。

背景技术

随着移动通信系统的发展，涌现出越来越多的通信系统的标准，例如：属于第二代通信系统（2G）的 GSM 标准（GSM:全球移动通信系统）、IS-95 标准和 CDMA 标准(CDMA:码分多址)，属于第二代与第三代通信系统之间过渡的 GPRS 标准(GPRS:分组数据业务)、TSM 标准（TSM:TD-SCDMA System for Moblie），属于第三代通信系统（3G）的 TD-SCDMA 标准(TD-SCDMA:时分-同步码分多址)、W-CDMA 标准(W-CDMA:宽带码分多址)和 cdma 2000 标准，以及目前非常流行的 WLAN 标准等。

按照国际电信联盟的规定，采用不同通信标准的移动通信系统应当使用不同频段内的载波传输数据。然而，随着通信业务的发展，出现了多种通信标准，即：不同的通信体制，使用同一频段内的不同载波传送数据的情况。一个典型的例子是由中国无线通信标准组织(CWTS: China Wireless Communication Standard group)提出的 TSM 标准与 TD-SCDMA 标准使用同一频段的例子。

TD-SCDMA 标准，是一种在时分双工模式下，采用同步码分多址技术进行数据传送的移动通信系统，而 TSM 标准，是设计用来从现有的 GSM 系统向 TD-SCDMA 系统演化的一个过渡标准，作为一个只是向 TD-SCDMA 系统平滑过渡的临时标准，TSM 使用了与 TD-SCDMA 相同的频段进行数据传输。

由于无线频率的资源有限，同时，又由于在从 TSM 向 TDSCDMA

系统演化的过程中，TSM 和 TD-SCDMA 的用户数目在不断变化，即：在演化的伊始，主要是 TSM 的用户，在演化的过程中，TSM 用户不断减少，TD-SCDMA 用户逐渐增多，直至演化接近完成时，TSM 用户极少，绝大部分将是 TD-SCDMA 的用户，在演化的不同阶段，TSM 和 TD-SCDMA 系统的用户数目迥异，因此所需要的频率资源也不相同，所以，应当根据不同需求，动态地在共存的无线通信体制之间分配有限的频率资源，实现无线资源的合理分配和重复使用。

发明内容

本发明的一个目的是提供一种多标准无线通信系统中的射频资源分配的方法和装置，该方法和装置能够根据需求，动态地在共存的无线通信体制之间分配有限的频率资源。

本发明的另一个目的是提供一种具体的多标准无线通信系统中的射频资源分配的方法和装置，该方法和装置能够在漫长的演化过程中，对共存的无线通信体制共享的频率资源实现统计配置，以提高频谱的利用率。

本发明的另一个目的是提供一种具体的多标准无线通信系统中的射频资源分配的方法和装置，该方法和装置能够在演化开始和结束阶段，对共存的无线通信体制共享的频率资源实现预期配置，以提高频谱的利用率。

为了实现上述目的，按照本发明提供的一种多标准无线通信系统中的射频资源分配方法，包括步骤：

检测所接收的多个来自上行链路的信号，该多个信号中包含有关于所请求接入的不同无线通信体制类型的信息；

根据检测到的所请求接入的无线通信体制类型的信息，对所述不同无线通信体制共享的射频资源进行分配。

为了实现上述目的，按照本发明提供的一种多标准无线通信系统中的射频资源分配装置，包括：

一个状态检测器，用于检测所接收的多个来自上行链路的信号，该信号中包含有关于所请求接入的不同无线通信体制类型的信息；

一个资源分配器，用于根据检测到的所请求接入的无线通信体制类型的信息，对所述不同无线通信体制共享的射频资源进行分配。

为了实现上述目的，按照本发明提供的一种无线通信系统，包括：

多个收发装置，用于接收和发送射频信号；

多个射频处理单元，用于处理所述收发装置所接收的或待发送的信号；

射频资源分配装置，用于检测所接收的来自上行链路的信号中包含的关于所请求接入的不同无线通信体制类型的信息，并根据检测到的所请求接入的无线通信体制类型的信息，对该不同无线通信体制共享的射频资源进行分配。

附图简述

以下将结合附图对本发明进行进一步地描述，其中：

图 1 是蜂窝通信系统的结构图；

图 2 是图 1 所示的蜂窝通信系统中的每个小区的结构图；

图 3 是图 2 所示的每个小区中的一个基站/节点的结构框图；

图 4 是预期配置方法一的流程图；

图 5 是预期配置方法二的流程图。

具体实施例

本发明提供了一种在共存的无线通信体制的基站中，根据共存的无线通信体制的不同需求，动态地分配无线资源的方法和装置。以 TSM、TD-SCDMA 共存的无线通信系统为例，该方法和装置应用在所述两个共存的无线通信体制的不同的演化阶段，分别具有不同的特点。

下面，将结合附图，分别描述在 TSM、TD-SCDMA 共存系统里，在演化过程中，本发明所提出的对共享的无线资源进行统计配置的方法和装置，以及在演化初期与末期，本发明所提出的对共享的无线资源进行预期配置的方法和装置。

如图 1 所示，图 1 是一个蜂窝移动通信系统的示意图，图中的 A、B、C、D、E、Z 分别表示 6 个通信小区，这 6 个小区构成了一个移动通信系统，其中小区 Z 是中心小区，小区 A-E 是小区 Z 的相邻小区。

图 1 中的每个小区都包含一个基站 10（或节点 B）和一个或多个移动终端 20，如图 2 所示。

图 3 中显示了图 2 中的一个小区基站 10（或节点 B）的组成。如图 3 所示，每个基站 10 包括：N 根用于接收和发送无线信号的天线 30、N 组射频单元 40 和一个控制器 50。其中：

每个射频单元 40，包括：一个收发信机、一个调制器和一个解调器。该收发信机的一个输入/输出端耦合到相应的天线 30 上，以接收来自天线 30 的射频信号或将无线信号经由天线 30 发送出去；该收发信机的另一个输出端耦合到所述解调器的输入端，以解调接收的射频信号；该收发信机的另一个输入端耦合到所述调制器的一个输出端，以将调制的信号传送到天线 30 进行发送。每个射频单元 40 具有各自的射频载波发送数据。

所述控制器 50，包括：一个处理器 60，一个分配器 80、一个存储器 70 和一个系统状态检测器 90。其中：该处理器 60 耦合到所述各射频单元 40 中的收发信机的另一个输入/输出端，以接收来自各射频单元 40 的信号，同时该处理器 60 还与分配器 80、存储器 70 和系统状态检测器 90 进行通信，具体地：状态检测器 90 根据来自处理器 60 的信号，检测所请求的无线通信体制的类型；存储器 70，在存储多标准无线通信系统中的射频资源分配信息的同时，如果基站选择的是统计配置射频资源的方法，则还用于记录在一段时间内状态检测器 90 检测到的每种无线通信系统的请求接入的次数；资源分配器 80，根据在统计配置方法中，存储器记录的不同无线通信系统请求接入的次数，或根据在预期配置方法中，状态检测器 90 检测到的无线通信系统请求类型与存储器中存储的射频资源分配信息，动态地分配该 TSM 和 TD-SCDMA 无线通信体制共享的射频资源；然后处理器 60，再根据资源分配器 80 的分配指示，控制调整相应射频单元 40 的载波

频率。

下面，按照 TSM 和 TD-SCDMA 演化的不同阶段，分别对上述的统计配置方法与预期配置方法进行详细的描述。

统计配置方法

通常，从 TSM 到 TD-SCDMA 的演化是一个漫长的过程，很有可能该过程会持续若干年。在这种情况下，两种无线通信体制的用户数目不会急剧变化，因此，射频资源的配置可以每隔一段时间进行，例如每隔一个月进行一次。

资源分配器 80，根据在这段时间中，存储器 70 中累计记录的 TSM 和 TD-SCDMA 无线通信体制被请求接入的次数，重新分配每个小区的射频载波，其中存储器 70 中累计记录的是这两种无线通信体制在这段时间中的全部时段上的业务负荷。存储器 70 中的累积次数，在开始下一个周期的频率分配过程时，将被清除，以重新记录在新的一段时间中，状态检测器 90 检测到的 TSM 和 TD-SCDMA 通信体制被请求接入的次数。

下面将给出统计配置方法的两个示例，在示例中，分配器 80 根据上述的无线通信体制请求接入的记录，进行动态地分配射频载波资源。

示例 1：

当分配器 80 在经过一段时间之后需要进行载波配置时，分配器 80 首先访问存储器 70，查询该存储器 70 中记录的由状态检测器 90 检测到的在这段时间里全部时段上，两种无线通信体制被请求接入的次数，并计算 TSM 对 TD-SCDMA 的业务比 R。之后，假定一个小区的射频载波的数量为 N，分配器 80 将 TSM 的载波数量分配为 N1，将 TD-SCDMA 的载波数量分配为 N2，N1+N2=N，并计算 N1/N2 的值，分配器 80 分别为 TSM 和 TD-SCDMA 分配几组 N1 和 N2 的值（为了保证两种无线通信体制均可以接入，N1 和 N2 应该不小于 1），并得到几个不同的 N1/N2 的值，然后，根据上述计算的 TSM 对 TD-SCDMA 的业务比 R，分配器 80 挑选 N1/N2 的值最接近 R 的，

将 N 个载波分配给 TSM 和 TD-SCDMA 两种无线通信体制。

例如，TSM 的业务记录为 3.4Erl，TD-SCDMA 的业务记录为 8.5Erl，并且 N=8，则 R=0.4。如果分配 2 个载波给 TSM，分配 6 个载波给 TD-SCDMA，将得到 N1/N2=0.3333。如果分配 3 个载波给 TSM，分配 5 个载波给 TD-SCDMA，将得到 N1/N2=0.6。如上所述，分配器 80 应当选择第一种分配方法，因为它更接近与 R。

示例 2：

在示例 1 中，分配器 80 是用一段时间里全部时段上的记录来计算 TSM 和 TD-SCDMA 的业务比 R。然而，由于最重要的数据是来自高峰时间的数据，因为它与阻塞率最相关，所以在示例 2 中，可以对示例 1 进行稍微的修正，即：只用高峰时间的业务数据代替全部时段的业务数据来计算所述 R，其余部分均相同。

预期配置方法

在演化的开始阶段，TD-SCDMA 的用户远远少于 TSM 的用户。这种情况下，如果在每个小区里仍然保留 TD-SCDMA 射频的载波将是低效的。本发明的预期配置方法的示例 1 就是来解决该问题的。

示例 1：

根据该预期配置方法，一个小区中的所有射频载波将分配给 TSM，只有在下列情况下，才有一个载波分配给 TD-SCDMA：

(1)在该小区里，有一个 TD-SCDMA 用户发出一个连接请求；

(2)在该小区里，有一个 TD-SCDMA 用户从一个邻近小区移入该小区，并且在该小区发出一个切换请求。

该预期配置方法如图 4 所示。在一个小区中，当没有任何 TS-SCDMA 用户连接时，所有的射频载波都是分配给 TSM 系统的(S1)。当在该小区里有一个 TD-SCDMA 用户发出一个连接请求或发出一个切换请求时(S10)，小区中的基站首先判断是否有空闲的 TD-SCDMA 资源(S20)，如果有，则将该资源分配给所述请求(S30)；如果没有，则判断是否有空闲的载波(S40)；如果有空闲的载波，则将该载波分配给 TS-SCDMA(S50)，然后将该射频资源分配给所述请

求(S60)；如果没有空闲的载波，则拒绝该请求(S70)，从而中断呼叫请求(S1001)。

一旦小区中的所有 TD-SCDMA 的呼叫结束(S1000)，即：在该小区中没有 TD-SCDMA 用户的连接，则由 TD-SCDMA 系统所占用的射频载波将重新分配给 TSM。

在演化的最后阶段，情况正好相反。除了极少数 TSM 用户之外，几乎所有的用户都是 TD-SCDMA 的用户。这种情况下，在每个小区里仍然保留 TSM 的射频载波将是低效的。本发明的预期配置方法的示例 2 就是来解决该问题的。

示例 2：

根据该预期配置方法，一个小区中的所有射频载波将分配给 TD-SCDMA，只有在下列情况下，才有一个载波分配给 TSM：

(1)在该小区里，一个 TSM 用户发出一个连接请求；

(2)在该小区里，一个 TSM 用户从一个邻近小区移入该小区，并且在该小区发出一个切换请求。

该预期配置方法如图 5 所示。在一个小区中，当没有 TSM 的用户连接时，所有的射频载波都是分配给 TD-SCDMA 系统的(S1)。当在该小区里有一个 TSM 用户发出一个连接请求或发出一个切换请求时(S100)，首先判断是否有空闲的 TSM 资源(S200)，如果有，则将该资源分配给所述请求(S300)；如果没有，则进一步判断是否有空闲的载波(S400)，如果有空闲的载波，则将该载波分配给 TSM(S500)，然后将该射频资源分配给所述请求(S600)；如果没有空闲的载波，则拒绝该请求(S700) ，从而中断呼叫请求(S1001)。

一旦小区中所有 TSM 呼叫都已结束(S1000)，即：在该小区中没有 TSM 用户的连接，则由 TSM 所占用的射频载波将重新分配给 TD-SCDMA。

在实际操作中，一般采用统计配置方法对大部分可用的射频载波进行分配，而预期配置方法通常应用在少数保留的载波上，以适应不

同无线通信体制中用户数目的快速变化。

有益效果

按照本发明所提供的多标准无线通信系统中的射频资源分配的方法和装置，由于该装置中的资源分配器可以根据状态检测器检测到的不同无线通信体制的请求，适时地分配共存的无线通信体制所共享的射频资源，因此，该方法和装置能够动态地在共存的无线通信体制之间分配有限的频率资源。

按照本发明所提供的具体的多标准无线通信系统中的射频资源分配的方法和装置，由于该方法和装置能够根据系统演化的不同阶段和系统业务的不同需求比例，分别采用统计配置与预期配置或统计配置与预期配置相结合的方式，因此，该方法和装置能够实现对共存的无线通信体制所共享的频率资源实现合理配置，提高了有限频率资源的利用率。

当然，对于本领域技术人员而言，本发明所提供的多标准无线通信系统中的射频资源分配方法，应当不仅仅限于采用 TSM 和 TD-SCDMA 标准的系统中，其还可以应用于其它多标准共存的无线通信系统中。

本领域的技术人员应当理解，对上述本发明所公开的多标准无线通信系统中的射频资源分配方法，还可以在不脱离本发明的内容的基础上作出各种改进。因此，本发明的保护范围应当由所附的权利要求书的内容确定。

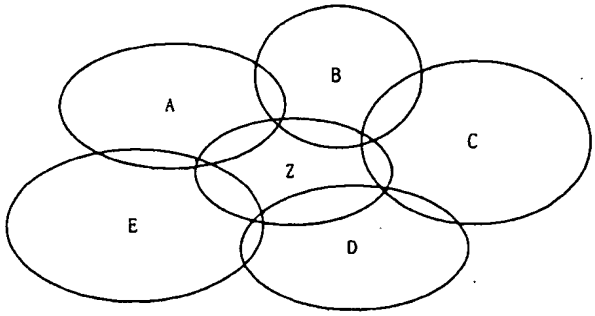

图 1

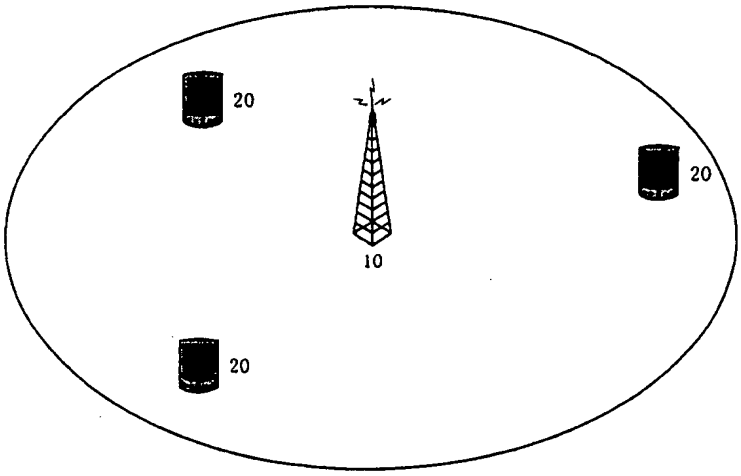

图 2

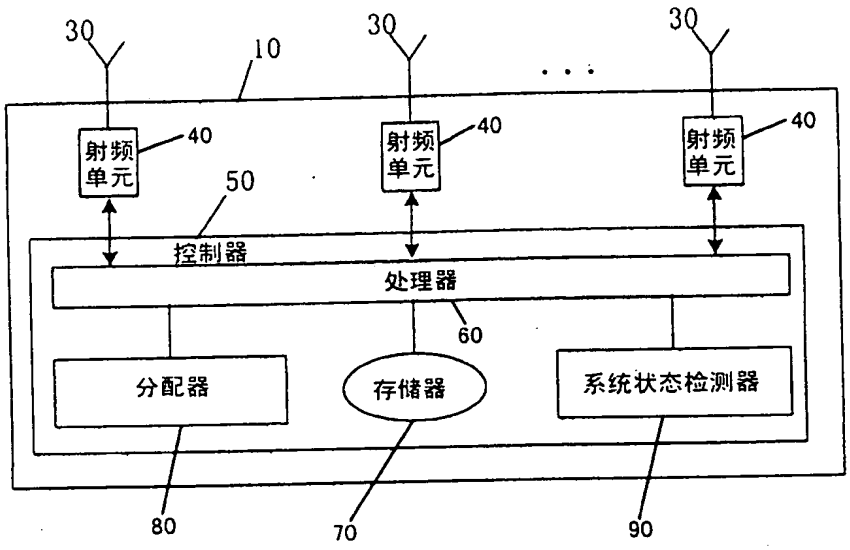
30
30
30
10
射频单元
40
射频单元
40
射频单元
40
50
控制器
处理器
60
分配器
存储器
系统状态检测器
80
70
90

图 3

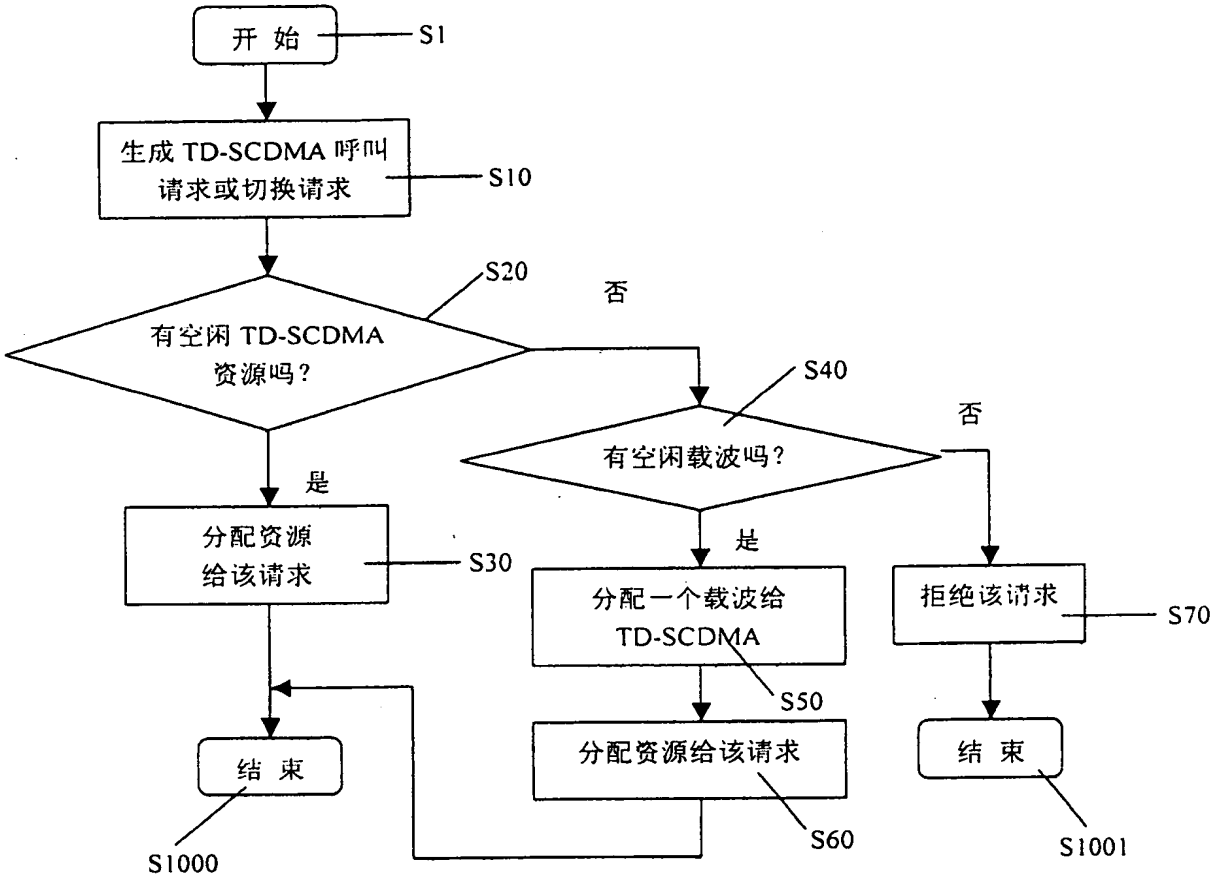
开 始
S1
生成 TD-SCDMA 呼叫
请求或切换请求
S10
S20
有空闲 TD-SCDMA
资源吗？
否
是
S40
有空闲载波吗？
否
是
分配资源
给该请求
S30
分配一个载波给
TD-SCDMA
S50
拒绝该请求
S70
结 束
分配资源给该请求
S60
结 束
S1000
S1001

图 4

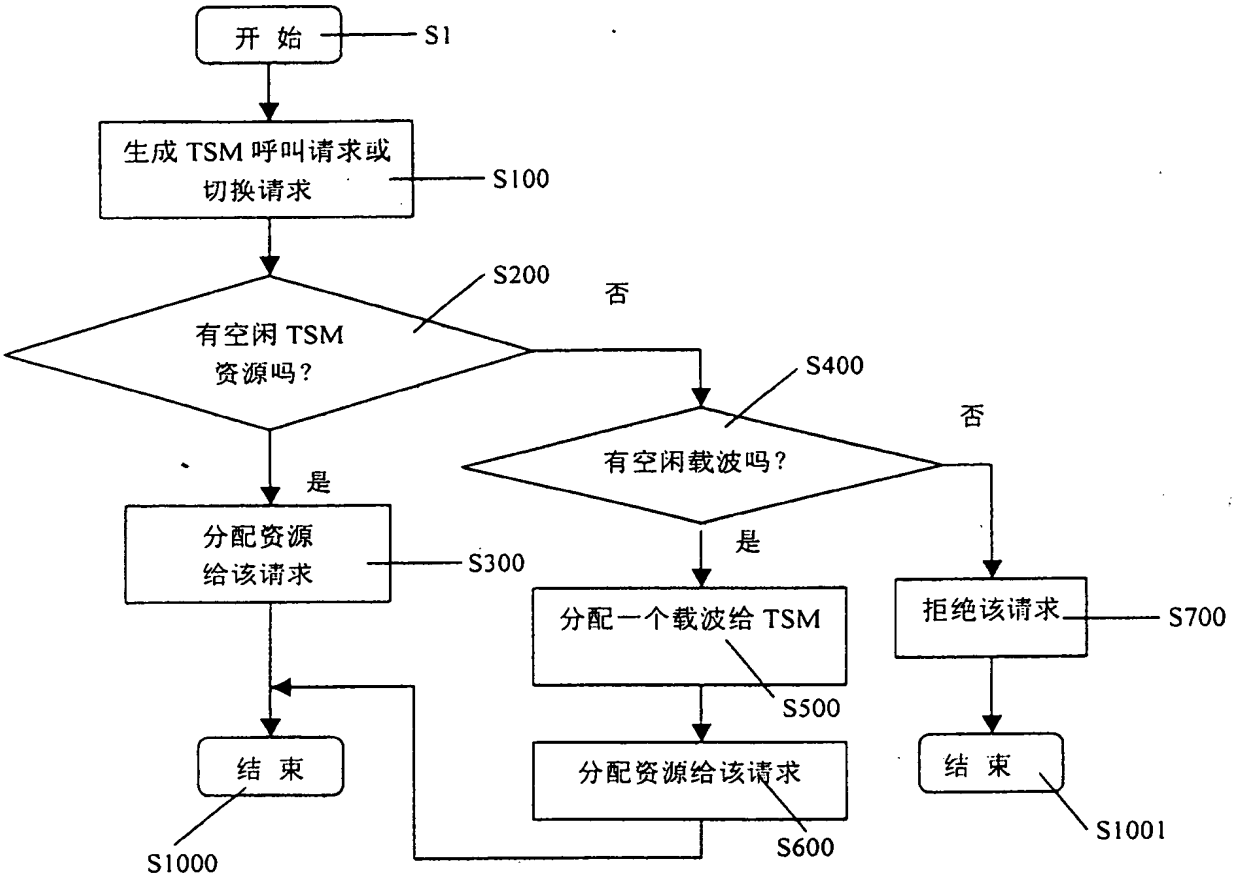
开 始
S1
生成 TSM 呼叫请求或
切换请求
S100
S200
有空闲 TSM
资源吗?
否
是
S400
有空闲载波吗?
否
是
分配资源
给该请求
S300
分配一个载波给 TSM
S500
拒绝该请求
S700
结 束
S1000
分配资源给该请求
S600
结 束
S1001

图 5